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By
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PREFACE

This is the first in a series of studies concerned with the structure of the market for fresh and processed apples in the United States. The problem is approached initially at the national industry level and subsequently broken down to the various regional aspects.

The ultimate objective of this series of studies is to develop a model that will predict equilibrium regional prices and consumption rates for fresh apples in any given year, and to determine least-cost patterns of interregional flows. Additional objectives are concerned with predicting the impact of changes in consumer income levels, prices of competing products, annual apple production, and transportation costs upon regional prices, consumption rates and movements of fresh apples.

SUMMARY

Production Trends

Technological changes have been the cause of a nearly fivefold increase in the production of apples per tree during the past 25 years. As a result the total production has remained nearly constant in the face of drastic reductions in the numbers of apple trees and farms. Heavy mechanization has led to the gradual establishment of large scale farms in specialized production areas.

Marketing Trends

In the early part of the century apples were considered a winter staple and were handled, packed and sold in bushel or barrel lots with practically no grading involved. Today fresh apples move through market channels as a highly perishable item. They are extensively graded, placed in small consumer packages and usually refrigerated before final sale. Where consumers once purchased the winter's supply in the fall and did their own storing, they now purchase weekly in small lots and let the producer or handler do the storing. The fact that production areas have become fewer and more distant from consumption areas has led to an increase in the interregional movement of fresh apples.

Since canning, and other forms of processing apples, is now accomplished in the factory rather than in the home, two distinct markets for apples at the farm have developed. Farmers now sell over one-third of their crop to processors with the remainder of the crop going to fresh apple markets. The processing market appears to act as a buffer between variations in crop size and the quantity going on fresh markets. Processors tend to buy heavy in surplus years and light in small crop years which results in a fairly stable annual volume moving to fresh markets.

Consumption Trends

During the past 25 years fresh apple per capita consumption has been falling at the rate of over one-half a pound per year while processed consumption has been increasing at the annual rate of about two-tenths of a pound. Total per capita consumption has declined by about 50 percent during the past 40 years, but has been levelling off during the past few years. Should consumption rates remain near current levels, increases in population would materially increase the market for apples in the near future.

Transportation of Fresh Apples

Because of the trend toward separation of production and consumption areas for fresh apples, the cost of transportation has become an increasingly important factor. At the present time the principle direction of long hauls is from west to east with the State of Washington accounting for over 42 percent of the total interregional shipments.

There is, in addition, a large volume of relatively short hauls from the eastern production areas to nearby markets.

Apple Storage

Almost two-thirds of the apples destined for fresh markets are placed in refrigerated storage before final sale. The storage operation materially lengthens the marketing period. Most of the refrigerated apple storage facilities are located on farms. Since the Pacific and Mountain areas market a relatively high percent of their crop in the fresh form they have over half of the total refrigerated apple storage capacity. There is a fairly steady movement of apples out of storage at a rate of about twenty percent per month from January 1 to June 1.

Foreign Trade in Apples

During the 1930's the United States exported about 15 percent of her total apple crop. In early 1960 net exports averaged less than 4 percent of the total crop. This drastic reduction in exports is due primarily to the fact that former importers are now nearly self-sufficient regarding apples. There is little reason to expect that exports will increase in the near future with the possible exception of small increases in shipments to Latin America.

Competition on the Apple Market

By applying various economic criteria it appears that the market for apples is a relatively competitive one. Despite the trends toward large scale producing and marketing organizations it appears that in most cases no single organization can materially affect the market. The homogeneity of the product, adequate market information and lack of discrimination between buyers and sellers also indicate that a fairly competitive market does exist.

Competition Between Producing Regions

The most severe competition between apple producing regions occurs on fresh markets in deficit areas. The fact that it is uneconomical to ship apples a long distance for processing precludes interregional competition in processing markets.

The Western Region is essentially self-sufficient in fresh apples. The Central Region produces less than one-third of its needs but obtains most of its apples from the Western Region. The North Atlantic Region produces over two-thirds of its needs and imports most of its additional needs from the Western Region. The South Atlantic Region produces less than half of its needs and imports heavily from the Western and North Atlantic Regions.

The timing of shipments is an important determinant of the degree of interregional competition. The general pattern is for local producers to market early in the season and for distant shippers to appear on the market relatively late in the season. Competition, therefore, is more severe between distant producers shipping to a given market than between a distant and local producer shipping to the market.

Competition Between Fresh and Processed Apples

Since the only possible method of storing apples from one year to another is in the processed form, the processing market is relatively sensitive to price changes and buys large quantities in surplus years for storage. The processing of apples is concentrated in the Appalachia region, New York, and California, which together account for almost 90 percent of the total pack. Even in these areas, where processing outlets are available, the prospect of diverting a portion of the fresh crop to processing diminishes rapidly as the marketing season advances. Since it is not economically feasible to incur the cost of placing processed apples in refrigerated warehouses, 85 percent of the pack is usually processed before December 1.

Competition Between Apples and Other Products

Although many other fruits are available as substitutes, citrus products apparently offer the most serious threat on the apple market. As per capita consumption of apples has been falling steadily, the consumption rate for citrus fruits has been rising. Improvements in methods of production and handling have placed citrus products in markets at prices which are becoming increasingly competitive with apples. The fact that citrus fruits have the same marketing season as fresh apples is further evidence that they are the prime competitor.

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Trends and Current Characteristics in the United States Apple Market

By William H. Drew*

INTRODUCTION

This study is concerned with the structure and operation of the market for fresh and processed apples in the United States. Although studies relative to the marketing of apples in specific regions have been made, there is a noticeable absence of industry-wide studies. Some possible explanations for this situation are: (1) Industry and political pressures have forced a major portion of marketing research funds to be applied to studies of those agricultural products which are most important from the standpoint of volume of gross sales. (2) The complexities of various grades and packages for products such as apples make it difficult to obtain accurate data. (3) Since major production areas are widely scattered across the country, a single industry-wide study is rather difficult to promote and to carry on.

The ultimate objectives of this study are to: Develop a model depicting the demand relationships for fresh and processed apples in the United States, and to compute, through linear programming techniques, a least cost pattern of interregional shipments of fresh apples in the United States under various sets of initial conditions.

In order to accomplish these above objectives, as well as to provide additional useful information relative to the market structure for fresh apples in the United States, considerable preliminary research is necessary. The following analysis is, therefore, concerned with developing the basic trends which have occurred in the industry, and describing the nature of the present-day market and the institutional factors involved.

Changes in the apple industry themselves point up the need for a comprehensive study of the market. There have recently been significant changes in the size and number of producers, relative importance of specific production areas, size and number of buyers, and the competitive position of apples vs. other fruits. Assessment of these factors is necessary to determine future policy actions for the industry as well as to develop economic models of the market.

During the past 25 years the apple industry of the United States has experienced far-reaching technological and institutional changes. In addition, similar changes that affected the apple industry have occurred in other segments of the economy. The result of any dynamic situation of this type is the evidence of certain trends that can give a general

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explanation of what is happening and perhaps be projected into the future. It is the purpose of the following section to discuss and/or analyze these trends.

I. IMPORTANT TRENDS IN THE APPLE INDUSTRY

Production

In 1920 there were 42 apple producing states. Since 1934 the United States Department of Agriculture has classified only 30 states as engaged in "commercial apple production." This information, in itself, indicates that a certain degree of concentration in the production of apples has occured since 1920. Additional facts to be presented will prove that there has been a reduction in tree numbers. Production of apples, however, has not declined. It would appear that elimination of unproductive areas and improved technology have been responsible for the fact that production has remained fairly stable in the face of a reduction in the number of trees.

Numbers of Trees

The census report in Table 1 shows that the number of apple trees growing in the United States in 1959 was only 20 percent of the number in existence 40 years earlier. Although part of this decline was due to changes in census definitions of orchards, there obviously has been a rapid decline in tree numbers. Since 1940, however, the relative rates of decline in bearing vs. non-bearing age trees has been markedly different. In fact there was an actual increase in non-bearing age trees from 1954 to 1959. The 1959 census indicated 65 percent less bearing age trees than did the 1940 census, while the numbers of non-bearing age (young) trees dropped only 35 percent.

The rapid decrease in the number of bearing-age trees during the latter part of the period was due primarily to the fact that many marginal trees had been removed. As apple production has become more specialized and spray programs more exacting it has been necessary to remove old trees that are declining in productivity as well as trees that have become too large to spray effectively. In addition, many trees have been abandoned. Increasing pressure on land by a rapidly expanding economy and population has necessitated replacement of unproductive trees with young trees or their removal in order that the land be released for other uses. The fact that numbers of young trees have not been declining very fast in recent years suggests that the general decline is in the process of levelling off, as specialized orchards are providing a stabilizing influence.

The increase in non-bearing age trees during the past five-year period is partially due to the fact that many orchardists are replacing standard-sized trees with dwarf trees. This is an attempt to reduce picking and spraying costs by using smaller trees. The fact that several dwarf trees are required to replace one standard tree in terms of space in the orchard or a given volume of production would tend to increase the number of trees planted. The increase in new plantings should be viewed also as a sign of optimism on the part of growers.

Table 1 indicates that total apple production has remained fairly stable during the last 40 years while the number of trees has dropped sharply. This has resulted in an increase in yield from 1.2 bushels per bearing-age tree in 1910 to 5.9 bushels in 1959. Table 1 also indicates very drastic increases in yield per bearing age tree during the past 10 year period. This is due to two major factors: (1) Changes in the census definitions of farms have eliminated most small backyard orchards.[1] They were not included in the reports. (2) Increasing pressures on land as mentioned above have forced either abandonment or replacement of unproductive trees.

Table 1. Number of Bearing and Non-Bearing Apples and Yield per Bearing Age Tree in the United States

Year	Bearing Age Trees (000)	Non-Bearing Age Trees (000)	Quantity* Harvested (000 bu.)	Yield/Bearing Age Tree (bushels)
1920	115,309	36,195	136,561	1.2
1925	103,697	34,299	152,967	1.5
1930	88,849	27,455	126,433	1.4
1935	82,535	17,519	124,237	1.5
1940	58,152	13,511	150,093	2.6
1945	†	†	135,968	†
1950	39,498	11,089	131,253	3.3
1954	25,044	6,800	109,038	4.4
1959	20,335	8,750	120,407	5.9

Source: U. S., Bureau of Census, *United States Census of Agriculture: 1950.* Vol. II, 680.

U. S., Bureau of Census, *United States Census of Agriculture: 1959. Preliminary*, 16.

* Refers to crop of the calendar year previous to year of enumeration.
† Not available.

Specialization

In 1930 (data not available for 1920) fruit growing was not the specialized business it has since become. Many general-type farms had a few acres of fruit trees: many farms classified as fruit farms were engaged in additional enterprises. In 1930, 5.6 percent of the income to fruit farms came from the sale of livestock and livestock products; in 1950 (data not available for 1960) this source accounted for only 3.3 percent.

Table 2 shows the change in percentage of total gross income for various type farms that was accounted for by the major enterprise or enterprises. As specialized dairy, poultry, and vegetable growers removed their few apple trees and as apple growers dropped supplementary enterprises, an increase in productivity over the nation could logically be expected. The trend to concentrating each farm's production

[1] "Farms" must now have at least 20 trees and if less than 10 acres must have at least $250 gross annual sales. If more than 10 acres in size must have at least $50 gross sales.

efforts on one enterprise has affected fruit growing as a two-edged sword. The grain, cattle, dairy, and poultry farmer is no longer interested in caring for a small orchard. His time is better spent on his major enterprise. The same situation holds true for the grower whose major enterprise is fruit. Orchards have become larger and apple production is now a specialized operation.

Table 2. Percent of Total Income Derived from Major Enterprise for Various Type Farms, United States, 1930 and 1950

Type Farms	Percent of Total Income from Major Enterprise 1930	Percent of Total Income from Major Enterprise 1950	Change 1930–1950
Fruit	89.9	96.5	+ 6.6
Dairy	80.0	92.2	+ 12.2
Poultry	81.9	95.5	+ 13.6
Cash-grain	70.3	79.9	+ 9.6
Vegetable	87.9	96.1	+ 8.2

Source: U. S., Bureau of Census, *Fifteenth Census of the United States: 1930. General Report,* Vol. IV, 930.

U. S., Bureau of Census, *United States Census of Agriculture: 1950. General Report,* Vol. II, 1230-1231.

Specialization in itself generally leads to more efficient operations in terms of costs and productivity. The present-day specialized orchardist is able to spend more time than did his forebears studying and putting into practice improved methods of growing and harvesting. The trend toward fewer larger farms has allowed production resources to be concentrated on farms where economies of scale are possible. The present day apple grower can afford mechanical sprayers, fertilizer spreaders, pruners, and harvesting equipment that not only reduce unit costs, but do a better job than is possible with hand labor. The number of sprays applied annually to apple orchards has at least tripled during the past 30 years, resulting in a sharp decline in apples unfit for commercial use.

Scientific research has materially increased the productivity of the nation's orchards. New varieties are more prolific than those of the early 1900's. Improved methods of pruning, spraying, and orchard management have resulted in a higher production of salable fruit per tree.

Regional Production

Some significant changes in the regional distribution of apple trees have occurred over time. Reference is made to Table 3. Since the first census reports on numbers of trees in commercial orchards appeared in 1940, the analysis is based on the period, 1940-1960. Although the number of trees in all areas has dropped sharply, it is obvious that some regions are staying in the apple business and others are not.

The central part of the country has experienced a drastic drop in tree numbers and will probably cease to be a commercial apple producing area. In most cases part-time orcharding in the Midwest has given

way to the more advantageous alternatives of specialized crop and livestock operations.

Table 3. Apple Trees, by Regions, United States, 1940-1960

Region	Numbers of trees, All ages			Ratio of numbers of trees	
	1940 (000)	1950 (000)	1960 (000)	1960 1940	non-bearing age (1960) Total (1960)
United States	71.663	50.586	28.969	.40	.31
New England	3.605	2.598	1.393	.38	.18
Middle Atlantic	13.084	9.352	5.326	.45	.23
East North Central	15.765	10.957	5.780	.36	.25
West North Central	5.153	3.269	1.070	.20	.31
South Atlantic	15.592	10.390	4.770	.30	.27
East South Central	6.770	4.480	.838	.12	.34
West South Central	2.702	1.560	.316	.11	.28
Mountain	2.123	1.856	1.462	.68	.38
Pacific	6.868	6.126	7.414	1.07	.42

Source: Bureau of Census, *United States Census of Agriculture, 1950 General Report*, Vol. II, 704-705.

Bureau of Census, *United States Census of Agriculture, 1959 Final Report*, Vol. I.

The Pacific area (including the Winatchee Valley) is the only one that experienced an absolute increase in the number of apple trees between 1940 and 1960. Although this area is a very important producer of apples, tree numbers are becoming misleading. The Pacific area for the past few years has been planting dwarfed trees in large numbers. Since it takes several dwarf trees to produce as many apples as one standard tree, the increase in numbers of trees is not necessarily indicative of a material increase in production. In fact, total production of apples in the Pacific region has been experiencing a sight downward trend during the past 20 years.

The northeastern portion of the United States (New England and the Mid-Atlantic states) currently has about the same number of trees as the Pacific area, but the former had almost three times as many trees in 1940. The major cause of this drastic change has been that high land values and taxes have forced unproductive orchards out of the urbanized Northeast.

Table 3 shows the percentage of total trees in each region that are of non-bearing age, which is an indication of the future trend in regional production. Those areas with high percentage of young (non-bearing trees) are the ones that are presumed to be vigorously maintaining or expanding their orchards. The relative positions of the northwestern and northeastern states are of importance in this respect. On the basis of current evidence, it seems that production will expand in the Pacific area and contract in the Northeast.

Table 4 shows that in 1920, four geographical divisions, the Pacific, Mid-Atlantic, East North Central, and South Atlantic, produced 74 percent of the total United States apple crop. The three smallest pro-

ducing divisions produced 12.4 percent of the total crop. In 1959, four divisions produced 90.1 percent of the total, while the three smallest producing divisions produced only 2.2 percent of the total. This is another indication of increasing area specialization in apple production. Also indicated in Table 4 is the bearing age tree productivity for the several geographic divisions of the United States. The areas that are apparently specializing in apple production are the ones with high yields per tree. It can be expected that the heavy planting of dwarf trees in the Pacific will cut yields per tree in future years. If the trend to planting dwarf trees continues, measures of productivity will have to be shifted from a "per tree" to a "per acre" basis. At the present time, adequate data on acreages of apple trees do not exist.

Table 4. Apple Production in the Geographical Divisions of the United States, Average 1919-1921 and Average 1958-1960

Geographical Division	Average 1919-1921		Average 1958-1960	
	Percent of Total Crop Produced by Division	Average Production (Bushel per Bearing Age Tree)	Percent of Total Crop Produced by Division	Average Production (Bushel per Bearing Age Tree)
United States	100.00	1.18	100.00	5.75
New England	6.4	1.90	5.3	5.41
Middle Atlantic	22.7	1.21	24.9	6.38
East North Central	15.9	.70	16.6	4.48
West North Central	5.7	.86	1.1	1.77
South Atlantic	11.7	.86	16.6	5.55
East South Central	3.5	.41	0.8	1.65
West South Central	3.2	1.55	0.3	1.44
Mountain	6.3	1.42	2.4	3.03
Pacific	24.6	2.52	32.0	8.63

Source: For the years 1919-1921. *U. S. Department of Agriculture, Yearbook 1921*, p. 625.

For the years 1958-1960. *Agricultural Statistics*, 1960, *U.S.D.A. Statistical Abstract of the U. S.*, 1961.

Labor Productivity

Time series data are not available on labor productivity in apple production. A rough approximation of relative change over time can be obtained, however, from data published annually in "Agricultural Statistics."[2] During the period 1920-1924, an average of 748 million man hours were employed to produce an average crop of 9.9 million tons of fruit.[3] During the period 1955-1959, the production of fruit had increased 76 percent to an average yearly crop of 17.5 million tons; the

[2] U. S. Department of Agriculture, *Agricultural Statistics:* annual publication (Washington: Government Printing Office).

[3] The inputs of labor included that used in the production of nuts as well as fruit. Since the production of nuts in the United States from 1928-1958 was consistently less than 1 percent of the production of fruit (by weight) it seems acceptable to ignore the production of nuts in this analysis.

labor required to produce the crop decreased 29.0 percent to 533 million man hours. Thus, over a 35 year period, the productivity of labor increased roughly 150 percent from .013 tons per man hour to .033 tons per man hour.

Current Trends

In summary, the following trends seem evident in apple production over the past 40 years:

(1) A sharp reduction in numbers of apple trees. During the last few years this reduction has been relatively greater in bearing-age trees than in young stock. This is an indication that unproductive trees are still disappearing rapidly but new plantings are starting to level off.

(2) A reduction in the number of fruit farms.

(3) A concentration of apple production into larger specialized farms.

(4) A fivefold increase in production per tree.

(5) A concentration of apple production into certain geographical regions.

Marketing

During the period 1920-1960, the marketing structure and technology for all produce items changed considerably. Changes occurred in grading, packing, transportation, handling, and selling methods. In the early part of the century apples were handled, packed, and sold much as potatoes were a few years ago. The most common containers were barrels and bushel baskets, little or no grading was done, and many apples were sold out of common storage in barrel lots. Apples were a staple fruit item in northern cities during the winter months. Today apples are handled as a perishable item. Lacking storage facilities for large quantities of fresh fruit, consumers purchase more often and in smaller quantities. The large supermarkets work on a principle of rapid turnover, maintaining relatively small stocks and demanding delivery about three times per week on perishable produce items. The grower or handler is now doing practically all of the storing job.

Regional Surpluses and Deficits

The apparent concentration of production on larger farms in specific regions has important implications as to the marketing and transportation of the nation's apple crop. It would appear to necessitate an increase in the transportation of apples from surplus to deficit areas. Some indication of the accuracy of this proposition can be gained from Table 5.

The surplus of 41 million bushels in the early period is somewhat misleading since non-commercial production (which seldom reached the market) is included. In addition, exports were quite high in the early 1920's, averaging about 10 million bushels per year.

Table 5. Average Regional Consumption and Production of Apples, United States, 1919-1921 and 1958-1960

Region	1919-1921			1958-1960		
	Average Apple Production*	Average Apple Consumption†	Average Surplus or Deficit	Average Apple Production*	Average Apple Consumption†	Average Surplus or Deficit
	(000 bu.)	(000 bu.)	(000 bu.)	(000 bu.)	(000 bu.)	(000 bu.)
New England	9,862	7,956	+ 1,906	6,185	6,362	— 177
Middle Atlantic	35,191	23,931	+11,260	29,033	20,729	+ 8,304
East North Central	24,522	23,086	+ 1,436	19,404	21,988	— 2,584
West North Central	8,791	13,485	— 4,694	1,317	9,365	— 8,048
South Atlantic	18,044	15,040	+ 3,004	19,287	15,706	+ 3,581
East South Central	5,479	9,561	— 4,082	913	7,334	— 6,421
West South Central	5,001	11,010	— 6,009	324	10,261	— 9,937
Mountain	9,676	3,585	+ 6,091	2,755	4,116	— 1,361
Pacific	38,102	5,985	+32,117	37,300	12,722	+24,578
Total regional deficits (—)		14,785			28,258	
Total regional surpluses (+)		55,814			36,463	
Total surplus available for export, economic abandonment or stockpiling		41,029			7,935	

* For the years 1919-1921. U. S., *Department of Agriculture, Yearbook 1921*, p. 625. For the years 1958-1960. U. S., *Department of Agriculture, Agricultural Statistics: 1959-1960.*

† These data were obtained by multiplying the average 1919-1921 and 1958-1960 national per capita consumption of fresh and processed apples (in terms of fresh farm weight) by the regional population in 1920 and 1960. The consumption data were obtained from: U. S., Department of Agriculture, Bureau of Agricultural Economics, *Consumption of Food in the United States: 1909-1952, Agricultural Handbook No. 62*, p. 116 and 1960 Supplement, August, 1961.

In the early period there was a regional deficit of over 14 million bushels to be transported to three deficit regions. In the later period a regional deficit of over 28 million bushels had to be moved to six deficit regions.[4] Thus, although per capita consumption of apples fell during this period, population increases in deficit regions and a concentration of production into fewer areas made it necessary for more apples to be transported between regions. Transportation is apparently becoming more important in the cost of marketing apples.

Processing and Fresh Outlets

There are two primary types of outlets for apples: those which use apples as a fresh product, and those which process apples. During the past 40 years, the percentage of the total crop and the absolute quantity of apples going into fresh use has been declining rather rapidly. There seem to be two basic reasons for this:

(1) An increase in the fresh fruit alternatives available to consumers in areas that do not have a winter fruit harvest. Improved

[4] In this analysis it was assumed that per capita consumption of apples was the same in all regions. Actually this is not entirely true, as will be shown in a later phase of the study.

production, transportation, and handling techniques have made it possible for American and foreign producers to keep fresh fruit in all major food markets during the winter months. This, and the rising level of consumer incomes has made it possible for the majority of the population to purchase such items as oranges, bananas, grapes, and pears in addition to apples during the winter months.

(2) Advances in food technology have made possible better processed apple products that compete actively with fresh apples. Frozen and canned slices have eliminated the peeling of fresh apples for pies in many households and most bakeries and restaurants. The savings in labor make it advantageous in many instances to substitute processed apples for fresh.

During the period 1956-1958 an average of 65 percent of the total apple crop was used fresh.[5] During the period 1920-1922, 94 percent was used fresh.[6] With total production remaining fairly stable from 1920 to 1958, it seems that both the absolute and relative amounts of the total crop going into processed outlets had substantially increased during the past 30 years.

Table 6 shows the average portion of the total production of apples used fresh in various geographical regions for two time periods. It is quite apparent that certain areas utilize a considerable portion of their crops in the processing industry, others primarily for the fresh market. Although the relative amount of the total crop going into fresh consumption has declined, it can be seen that the same areas produced primarily for the fresh market in both time periods and that the states which processed a large portion of their crop in the early period processed even more in the later period. There are several reasons for this:

(1) Some areas are best suited, by soil and climate, for growing those varieties of apples most desired for fresh use.

(2) Some producing areas are close to metropolitan centers and thus are in a better position to supply nearby fresh markets. Producers in these areas are usually operating at relatively high costs due to industrial and urban pressures on the land and labor force. Because gross returns from processing apples are relatively low, growers for this market tend to locate in less populous areas.

(3) Institutional factors are important here. Over time processing plants have been built in specific areas, labor has been imported and/or trained to service these plants, selling and buying organizations have been established and growers have become accustomed to growing, harvesting and handling apples for processing outlets. As these factors reinforce each other the institutional framework of production and utilization is definitely slanted toward processing. The same sort of thing can happen

[5] U. S. Department of Agriculture, *Agricultural Statistics: 1942 and 1959*, pp. 162, 160.

[6] Ibid.

in producing apples for fresh use. The State of Washington is a typical example. During the period 1958-1959, 90 percent of the apples produced in Washington were Winesaps or Delicious. These varieties are not well suited to processing but, in most consuming areas, are prized as fresh fruit.

Table 6. Percentage of Total Apple Production Used Fresh in Various Regions of the United States

Region	Average Percent Fresh 1934-38	Average Percent Fresh 1956-60	Percent Change (1934-38) (1956-60)
North Atlantic	67.1	56.6	—10.5
South Atlantic	76.1	54.8	—21.4
Central	83.8	70.6	—13.3
Western	78.4	71.6	— 6.8
United States	76.0	64.5	—11.5

Source: U. S. Department of Agriculture, *Agricultural Statistics.*

Consumption

Per capita consumption of apples has declined considerably during the past 40 years. During this period total per capita consumption of apples (farm weight equivalent) dropped 50 percent. The decrease has been cause for considerable alarm in the apple industry although a continuing expansion of population has prevented a sharp decline in the market for apples. The chances seem slight for substantially increasing the per capita consumption of apples in the near future. During the 1920's and 1930's apples were bought in large quantities and stored fresh (or canned at home) for winter consumption when few fresh fruit alternatives were available. As stated previously, recent technological advances in production, transportation, and handling now make it possible for many other fresh fruits to compete with apples during winter months. There is no indication of a lessening of this competition, nor of a drastic shift in consumers' tastes in favor of apples. Notwithstanding, even a maintenance of present consumption levels will require an expansion of production which has yet to occur. With the current annual rate of population increase at about 2,500,000, apple production would have to increase roughly 1.3 million bushels per year to maintain present consumption levels.

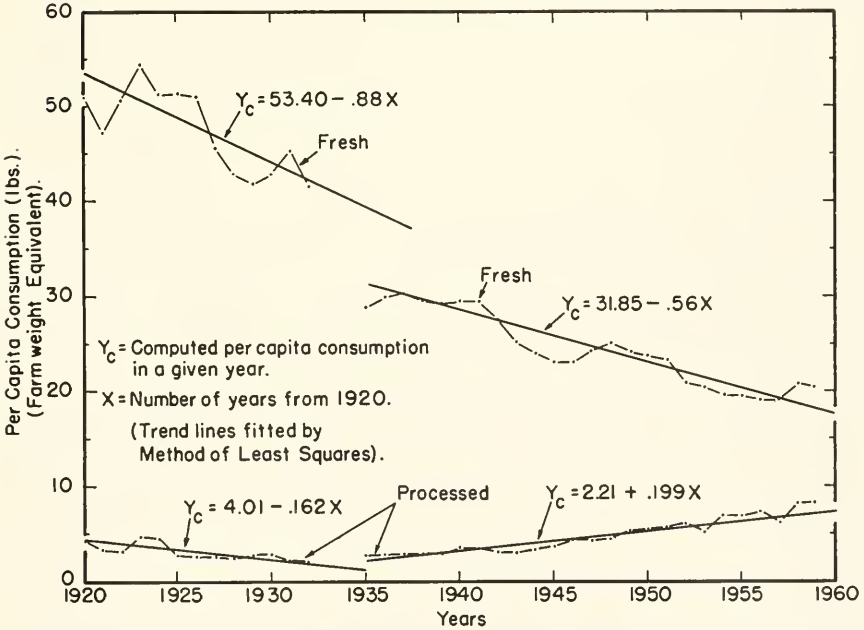
Per Capita Consumption Declining

The decline in total per capita consumption of apples has been due entirely to a decreasing rate of fresh consumption. The per capita consumption of processed apples has increased during this time period. Relevant to the last fact, the increase in processed consumption may be a mere change in accounting. During earlier periods the large quantities of apples purchased for home canning are recorded as fresh sales. Today, most of the canning is done commercially and consumption is recorded as processed.

All statistics concerning apple production have a "break" in 1934 when the basis of reports was changed from "total production" to "commercial production". Consumption data have a similar break since they are obtained by subtracting quantities unharvested and quantities used on the farm from total production. The consumption rates shown in Table 1 were therefore broken from 1932 to 1935. When trend lines are fitted by the method of least squares, Chart 1 shows that the rate of decline in per capita consumption of fresh apples was smaller in the latter period. The rate of per capita consumption of processed apples, however, increased during the latter period after declining from 1920 to 1932. This can be best explained by the diminishing rate of consumption of dried apples and the increasing rate of consumption of canned and frozen products. As the use of dried apples declined during the early period and the per capita consumption of canned apple products remained about constant, the total rate of consumption of processed apples declined. During the later period, the per capita consumption of canned and frozen apple products (the latter initially appeared in consumption figures in 1938) increased as shown by the trend line fitted to per capita consumption of processed apples in Chart 1.

CHART 1

Per Capita Consumption of Fresh and Processed Apples, United States, 1920-1960 (2 year centered moving average).



Source: *"Consumption of Foods in the United States"*, Supplements for 1956 and 1960, Agricultural Handbook No. 62, Agricultural Marketing Service, USDA, Washington, D. C., page 6 and 21.

(Beginning 1934 includes only apples grown in commercial orchards.)

By making certain assumptions some indication of the market for apples in 1970 can be presented. The assumptions made in the first case are (1) that population continues to expand at somewhat near the current rate, and (2) that per capita consumption of all apples continues to decline at the current rate.

Assuming that population will increase to the high figure predicted by the Bureau of the Census, the market for apples will experience some increase in demand between 1960 and 1970. The net effect under these assumptions is an increase in total consumption of apples of over 3 million bushels or about 3 percent of current levels. Should population increase only up to the Census Bureau's lower estimates, the market would increase by about 0.6 percent of present levels.

The above analysis assumes a constant decline in per capita consumption of 0.36 pounds per year. Should per capita consumption level off near current rates (as it appears to be doing since 1955) total consumption of apples could increase by over 15 percent of current levels.

In summary, it seems that apple producers can expect some increase in market for their product during the next 10 years. Should consumption rates level off, increases in population could materially increase the market for apples.

II. CURRENT CHARACTERISTICS OF THE APPLE MARKET

The previous section attempted to show the path that the industry has followed in acquiring its current characteristics. The next problem to be undertaken will be that of describing the current structure of the apple market.

Transportation of Apples

The fact that commercial apple production is currently centered in rather specific regions has definite implications regarding the market structure for this crop. Because the major producing areas are not invariably the major consuming areas, the process of equating supply and demand results in considerable interregional transportation in an ordinary crop year.

Total reported rail and truck shipments between the major producing states and 24 major city markets are shown for 1959 and 1960 in Table 7. Two states, Washington and New York, accounted for over 60 percent of the total 1959 and 1960 shipments (New York City receipts from "Upstate" New York accounted for much of this state's shipments).[7]

Washington and California shipped to almost every major city listed during this period. California's shipments to individual markets, how-

[7] The shipments referred to in this analysis are of apples for fresh use. It is virtually impossible to report shipments of apples for processing use because they are usually short distance hauls in farmers' or processors' trucks and accurate records are not available.

Intra-state shipments to small city markets are not included, with the result that some producing states with high concentrations of population (such as the northeastern states) do not show up as important shipping states.

Table 7. Rail and Truck Shipments of Fresh Apples to 24 Major Cities, United States, 1959 and 1960
(Carlot Equivalents)

Receiving Cities	Illinois	Virginia	Pennsylvania	New Jersey	Vermont	New York	Washington	Idaho	California	Michigan	West Virginia	Total Receipt	% of Total Receipt
Los Angeles							5860	496	2180			8536	13.40
Seattle							600		12			612	0.96
Portland							739	14	11			764	1.20
San Francisco							1824	76	1437			3337	5.24
Denver	50	1					783	107	67	5		1018	1.60
Ft. Worth	1	60	8			2	192	10	12	9	15	309	0.48
Dallas		179	3	2		14	1057	21	23	41	42	1382	2.17
New Orleans	3	224					885	5	8	14	20	1159	1.82
Jackson, Miss.							240					240	0.38
Atlanta	2	881	133	3		94	620			101	90	1924	3.02
Birmingham	3	848	63			1	559	2	5	28	35	1544	2.42
Minneapolis	23	16	16			5	1059	14	1	202	33	1369	2.15
Cleveland	9	63	125	20	66	520	668			422	94	1987	3.12
St. Louis	348	27	32	3		10	825	7		708	13	1973	3.10
Kansas City, Mo.	32			2		6	657	11	1	297		1006	1.58
Cincinnati	37	63	14	23		209	698	1	7	303	125	1480	2.32
Detroit	24	24	3	25		18	634			1499	36	2263	3.55
Chicago	179	189	23	40	9	382	2928	6	2	1930	32	5720	8.98
Philadelphia		539	811	1289	29	696	1014			1	107	4486	7.04
Pittsburg	16	134	703	41	15	798	796			81	334	2918	4.58
Washington, D. C.		681	252	67	2	84	439				117	1642	2.58
Baltimore		228	552	233	2	157	252				463	1887	2.96
New York		259	500	1037	1041	9233	3032	11	1		39	15153	23.79
Boston		13	11	171	95	276	421		1		10	998	1.56
Total Shipment:	727	4429	3249	2956	1259	12505	26787	781	3768	5641	1695	63707	100.00
% of Total:	1.14	6.95	5.10	4.64	1.98	19.63	42.05	1.23	5.91	8.85	2.52	100.00	

Source: Fresh Fruit and Vegetable Unload Totals in 100 Cities, 1959 and 1960 (AMS-25) U.S.D.A. Agricultural Marketing Service, Fruit and Vegetable Division, Market News Branch.

ever, were very small. The practice of spreading shipments "thin" over all of the markets in contrast to sending large volumes to a few markets is probably explained by the nature of California's apple production. During the 1958 and 1959 seasons, California accounted for 50 percent of all summer apples produced. Following the maximum profit motive in this situation, shippers offered only small quantities for sale in many markets in order that high prices might prevail.

It is quite apparent that the principle direction of long hauls is from West to East. This is because Washington is the primary surplus fresh apple region. With the exception of shipments from the Washington and California areas most other shipments are to nearby areas.

Apple Storage

The annual production of orchard fruit cannot at present be controlled to any great extent by human forces.[8] Total apple production in any given year can, therefore, be considered as predetermined. Once the crop is produced, the apple industry has the choice of harvesting all or any portion of it dependent upon such factors as harvest costs, size and condition of total crop, production of competing fruits, and storage facilities. After a given portion of the total crop is harvested, decisions must be made concerning methods of marketing to be employed.[9] These decisions concern the relative use of fresh or processed outlets. Following these decisions, the individual grower (or the industry) is left with a certain quantity of apples to be sold through fresh-use outlets. One additional major marketing decision is yet to be made.

Cold Storage of Apples

This concerns the alternatives of selling immediately or storing apples for sale at a later date during the marketing season. What is usually developed is a selling schedule involving heavy sales at harvest followed by a rather stable movement out of cold storage tempered by short-term price fluctuations. During the period 1957 to 1960 an average of 42 percent of the harvested commercial crop went into cold storage in the fresh farm. Of the apples sold for fresh use, 64 percent had been in cold storage before final sale at the retail level.

Apples are stored at the farm and at the wholesale level, in both private and public warehouses. "Public warehouses" are considered to be those in which storage space is rented by the user; "private warehouses," those owned by the user. In many cases, warehouses are considered to be "semi-private," because the owner uses space and also rents space. These three classes of warehouses appear at both the farm and the wholesale level. There has been a recent trend away from public to private warehouses caused by factors of both physical and economic natures. On the physical side, it has been found that apples require quite exact temperature and humidity conditions if high quality is to

[8] Technological innovation is making some progress in this area through such developments as spray materials to control set and drop of fruit, irrigation, systemics, rain-making, etc.

[9] This compares with the statistic "commercial production having value" appearing in various crop reports.

be maintained. These conditions are not easily obtained in public warehouses which usually store many different types of commodities. In addition, the recently developed "controlled atmosphere storage," which involves sealing off rooms and controlling the oxygen content of the air therein, is not yet widely available in public warehouses. On the economic side, growers are finding it advantageous to own and operate their own cold storage facilities for two primary reasons: (1) The construction of a cold storage warehouse offers employment opportunities for farm workers during slack seasons, and (2) The location of storage facilities on the farm reduces the marketing costs in terms of hauling costs and quality loss.

Regional Cold Storage Facilities

Table 8 shows that the Mountain and Pacific areas have over 55 per cent of the total storage space but produce only 34 percent of the total crop. These areas, however, during the period 1957 to 1960 marketed 72 percent of their total crop in fresh form. These areas are also prone to greater use of private storage facilities. Apple production on these specialized farms is apparently important enough to warrant the building of cold storage facilities for the exclusive purpose of storing apples.

Table 8. Refrigerated Apple Storage Facilities by Regions, United States, October 1, 1959

	Net Piling Space			% of Total U. S. Production
	Total 1000 cu. ft.	% of Total for U. S. (percent)	"Public" as % of Total in Region (percent)	in Region 1958-1960
New England	10,722	6.53	*	5.31
Mid-Atlantic	26,641	16.22	28.87	24.92
E. N. Central	16,892	10.28	10.09	16.65
W. N. Central	— 1	— 1	— 1	1.13
South Atlantic	17,767	10.81	48.66	16.55
E. S. Central				
W. S. Central	— 1	— 1	— 1	1.06
Mountain & Pacific	91,096	55.45	13.40	34.38
United States	164,282	100.00	18.78	100.00

Source: "Capacity of Refrigerated Warehouses in the United States, October 1, 1959" U.S.D.A. Agricultural Marketing Service Co. St. 2 (60), October, 1960.

* Not shown to avoid disclosure of individual plant reports, but amounts are not large.

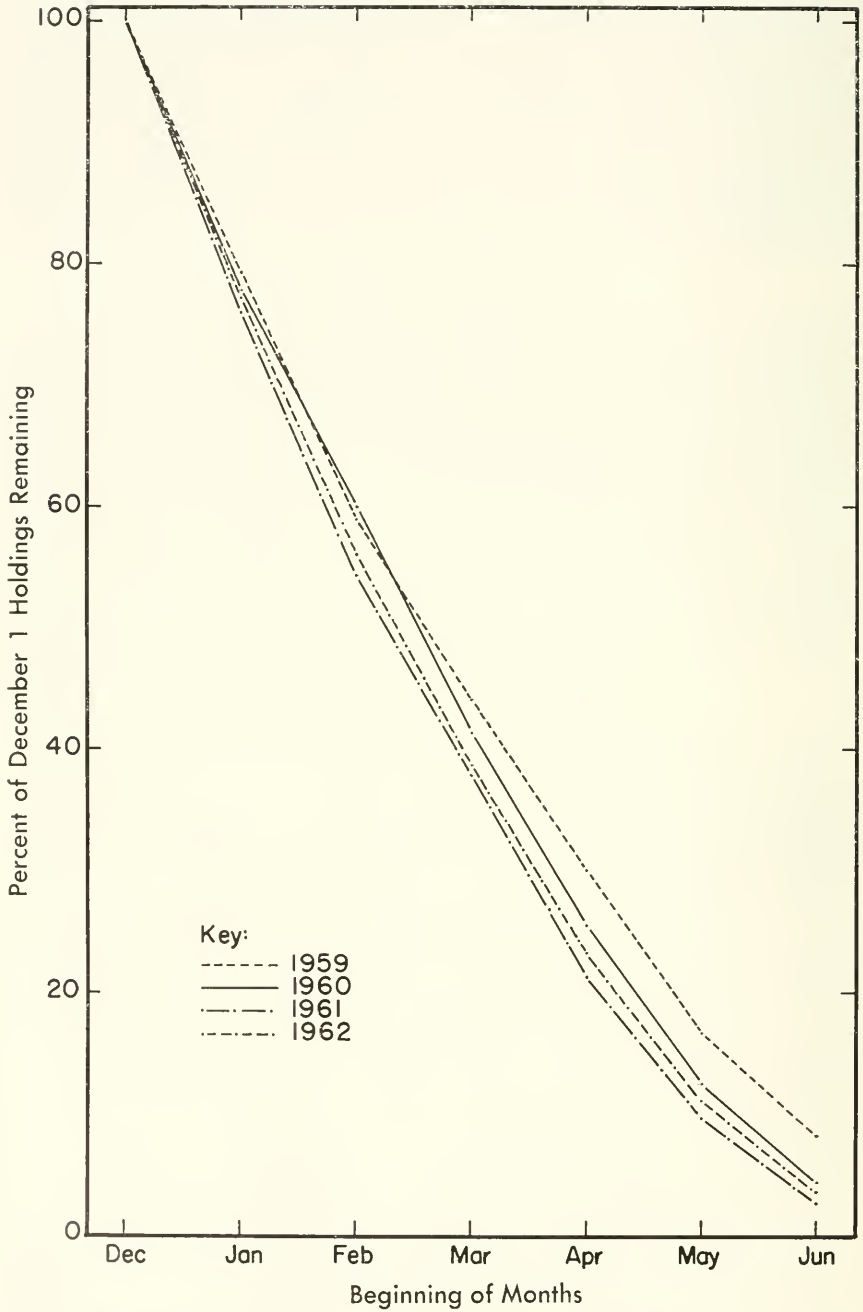
Moving Apples Out of Cold Storage

A general picture of the movement of apples out of cold storage during the marketing season shows a fairly steady rate of about 20 percent of the total quantity stored per month until April 1.[10] Although the quantity of apples moving out each month varies from year to year, de-

[10] December 1 holdings are considered to be the total.

CHART 2

Out-of-Storage Movement of Fresh Apples, United States, 1959-1962



Source: *Cold Storage Reports* (Monthly) U. S. Department of Agriculture, Agricultural Marketing Service.

pending on the total amount stored, the rate, in terms of percent, of the amount stored is quite constant, as shown in Chart 2.

In addition to the 64 percent of the fresh apple crop that goes into cold storage annually, a good portion of those remaining is not sold at harvest time. Many apples are placed in "common storage" before movement into retail channels.[11] Apples so stored must be moved out during the early part of the marketing season, as they lose quality rapidly. Thus, during the months of September, October, November and December the movement of fresh apples into retail channels is very heavy, with apples originating from three sources: (1) direct from harvest operations, (2) common storage, and (3) refrigerated storage (this is not significant until December).

Foreign Trade in Apples

Currently, foreign trade is relatively unimportant to the apple market. During the past 20 years, apple exports have been declining rapidly while imports have been increasing slightly, leading to the present import-export balance as shown in Chart 3.

Foreign Trade in Apples Declining

Chart 3 shows a drastic reduction in apple exports between 1938 and 1940. This occurred presumably because of the curtailing of all foreign trade prior to World War II. During the post-war period net apple exports have not increased; in fact, there has been some tendency for them to decrease still further. Two factors have been primarily responsible for this. First, the dollar shortage in Great Britain and France, formerly the principle receivers of apple exports, sharply reduced purchases. The import policy of these countries was to shift dollar purchases away from non-essential items, such as apples, to items essential to the economic redevelopment. The second important factor concerns apple production in Europe. During the period 1935 to 1939 average production was at about 289 million bushels. By the period 1958 to 1960 the average annual production had increased 70 percent to 494 million bushels. It would appear, therefore, that Europe is now in a better position to satisfy its own demand for apples. The former prime importers of American fresh apples, Great Britain and France, have increased their production of fresh apples by 290 percent.

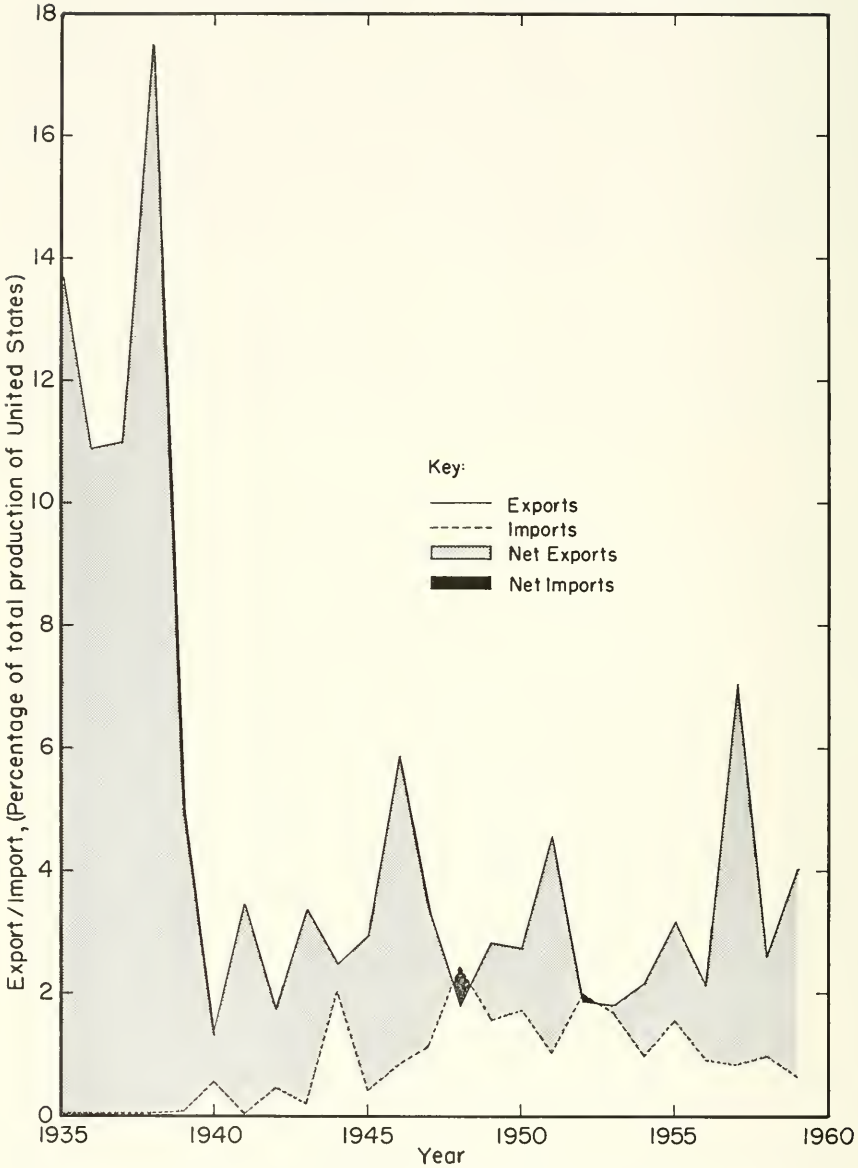
Little Change Expected in the Future

The current upward trend of apple production in Europe gives scant indication of a possible increase in United States apple exports as the dollar shortage is relieved. A possibility does seem to exist for expansion of exports to Latin America. Exports to this area now total about 700,000 bushels, having increased 54 percent since the period 1934 to 1938. Should exports double during the next decade, they would still amount to only about 1 percent of total production. Since this area produces many fruits other than apples for domestic use, the potential for exports here does not seem great.

[11] The term "common storage" refers to non-refrigerated storage facilities.

CHART 3

United States Foreign Trade in Apples, 1935-1960



Source: *Agricultural Statistics* U. S. Department of Agriculture.

In summary, it seems safe to conclude that foreign trade will continue to play a very minor role in the disposition of the United States' apple crop.

III. COMPETITION IN THE APPLE MARKET

In our modern American economy the elements of imperfect competition are quite evident. One often hears, however, that "on the farm free competition reigns (or rages)." Whether or not one agrees with this assertion, it is apparent that no such blanket statement could hold true for the entire agricultural industry. It is the intent of the following analysis to determine the nature of the economic competition prevailing in the apple market.

Nature of the Competition

The fresh apple market probably comes quite near to meeting the economists' conception of a "competitive market." In order to examine this proposition, the conditions for a competitive market as indicated by Boulding will be applied to the fresh apple market.[12]

1. Large Number of Buyers and Sellers

This condition, applied to sellers at the farm level, is undoubtedly met as the 1959 Census of Agriculture lists 184,462 farms having commercial orchards. Since most growers act independently, the volume of sales of any one does not affect prices or sales of any other grower.

As to buyers, it can be assumed that there is also a large number in this segment of the market, for, historically, apples have moved from individual farms to small wholesalers and thence to retail levels. The large city fruit auctions also imply that many buyers are active.

Although trends toward large-scale buying by cooperative wholesalers and chain stores, which are being met by farmers' cooperative selling agencies, may reduce the competitive nature of the apple market, its structure is currently typified by many buyers and sellers.

2. A Homogeneous Product

One is tempted to dispose of this requirement by stating that "apples are apples" and, therefore, the product is homogeneous. Any apple buyer would perforce dispute the claim because apples must be classified by grade and variety. It can be averred, however, that within any grade and varietal class, apples are a homogeneous product. The degree to which this hypothesis is true is controlled by the accuracy with which apples can be graded (assuming that varietal differences are easily determined). In most cases, it is possible to grade apples to rather close limits. There are isolated instances, of course, where a certain buyer will prefer apples from a certain grower. Such situations are most likely to occur in small local markets where wholesalers or retailers are close to the producer. In large city markets and fruit auctions there is little likelihood that buyers differentiate between various lots of "MacIntosh U. S. No. 1, 2½ inches and up."

In general, producers are required to stamp their names on wholesale packages. This does not distinguish one lot of apples from another (with-

[12] Kenneth E. Boulding, *Economic Analysis* (rev. ed., New York: Harper & Bros., 1948), pp. 49-50.

in certain grade and varietal group) in any manner that would cause imperfections in the free market. If, however, a grower has a substantial advertising program for his "mark," he can theoretically build up preference for his particular lot of apples. When the output of a particular firm can be identified and is advertised, the condition of homogenity of the product may not be met even though the product is physically homogeneous. This is not the usual case with apple producers.

An additional possibility for product differentiation in the fresh apple concerns classification by area of origin. This is exemplified by Delicious and Winesap apples produced in the Pacific Northwest which are identified (by package type, label, etc.) and advertised.[13]

Earlier price series distinguish only between "Western" apples and "Eastern" apples. In more recent publications concerning farm and wholesale prices, fresh apples are, in some cases, identified as being grown in New England, Western States, New York, and the Appalachian Regions.[14] This differentiation does imply some lack of homogeneity in the fresh apple product on a nation-wide basis. The degree to which this affects the price-making process depends, in part, upon the origin of the receipts in a given market. If a market's receipts are predominantly from one producing region there will be little effect. In some markets, however, it may be necessary to consider apples from different regions separately; western and eastern apples would be considered different products and homogeneity would be confined to apples (of a certain grade and variety) within each of the above "production area" classes.

3. Close Contact of Buyers and Sellers

Reference is made here as to whether complete market information is available to all buyers and sellers. It is difficult to determine whether or not this condition is met since in most every instance there is some lack of contact between all individuals in all markets. In the case of fresh apples, the Department of Agriculture's Crop Reporting Service issues monthly reports on estimates of crop size by states during the summer and fall. In addition, the Department's Agricultural Marketing Service issues monthly reports on cold storage holdings and four "Fruit Situation" reports. At the state level, Agricultural Extension Services and Departments of Agriculture make available information relative to local and distant market conditions. Large city markets issue daily reports on receipts by rail and truck. In view of modern methods of communication and the great supply of information on market conditions for apples and competing fruits, it seems reasonable to assume that the condition is met.

4. No Discrimination

This condition has reference to proneness of individual buyers and sellers to make bilateral agreements relative to the price of a given lot

[13] The advertising is carried out principally by the Washington State Apple Commission.

[14] U. S. Department of Agriculture, Agricultural Marketing Service, *Fresh Fruit and Vegetable Prices: 1961*, Statistical Bulletin No. 307.

of apples. Economic theory holds that a market characterized by many buyers and sellers would indicate a uniform price with little or no "higgling" present. From the writer's experience, however, it would seem that this is not true on small markets where producers, wholesalers and retailers are all in direct contact and "higgling" is the "order of the day." This discrimination has been diminishing during the past few years as small local markets have been disappearing. The construction of modern marketing facilities in large cities and "regional" facilities for groups of smaller cities has resulted in bringing many buyers and sellers together and has created an atmosphere where a standard price for products is more possible. In large city markets, shipping centers, and fruit auctions, there is very little chance of discrimination between identical lots of apples.

Since processors of apples are not nearly so numerous as wholesalers of fresh apples, a relatively small number of buyers can be expected at the processor buying level. As growers in some areas produce mainly for the processing market, this may result in a lessening of the competitive aspects of certain markets. Any grower has the alternative, however, of selling on the fresh market. Although processors are usually few in number and purchase in large quantities, the competitive aspects of the market are not interferred with as much as if the processing and fresh markets were separated at the farm level. Since practically all varieties can be moved into either outlet, the prices of apples for these two portions of the market will not be allowed to differ by much more than the relative differences in harvesting and handling costs at the farm for the two segments of the market.

A Relatively Competitive Market

In general, it can be stated that competitive conditions do exist on a city market or fruit auction selling lots of apples which are identical as to quality and variety and origin. On a market containing apples of many different grades which were produced in various areas we move away from the above conditions for a competitive market.

The major obstacles to a competitive market concern the homogeneity of the product itself. If analysis is confined to identical lots of apples that are produced in a single region, competitive conditions exist. The degree of competition existing on a given market, therefore, is determined largely by: (1) the number of different grades of apples and the quantity of apples within each single grade, and (2) the number of regions shipping apples into the given market.

Competition Between Producing Regions

The keenest competition between apple producing areas occurs on fresh markets in deficit areas. Since it is not economically feasible to ship apples for processing any great distance, interregional competition on processing markets is usually slight. In addition, over time, the institutional framework of the processing industry has been established in such a manner that interregional movement of fresh apples for processing use is unnecessary.

Regional Surpluses and Deficits

On the fresh market, the trend to concentration of production in certain areas has led to a situation where interregional movement is becoming more important.[15] During the period 1919-1921, the average total regional deficit was 14,785,000 bushels, 9 percent of the average total crop. During the period 1958-1960, the average total regional deficit was 28,258,000 bushels, 24 percent of the average total crop. Thus, both the absolute and relative quantity of fresh apples entering into interregional trade are increasing.

Table 9 shows the regional pattern of fresh apple production and consumption. The largest deficit occurs in the Central Region which must import from other areas almost half of the total quantities of fresh apples consumed. Table 10 pertains to receipts by origin of fresh apples, during the calendar years 1959 and 1960, on 24 major city markets.[16] Since the truck shipments within local producing areas are not recorded, the data probably overemphasized the importance of distant shipments. The main concern here, however, is the relative differences in the importance of distant supply areas between the four regions.

Table 9. Average Regional Production and Consumption of Fresh Apples, United States, 1960

Region	Commercial Production	Fresh Sales & Farm Household Use	Fresh Comsumption*	Surplus (+) or Deficit (—)
	(1,000 bu.)	(1,000 bu.)	(1,000 bu.)	(1,000 bu.)
Western	31,920	22,592	11,160	+ 11,430
Central	23,625	17,669	33,687	— 15,988
N. Atlantic	21,420	19,432	18,352	+ 1,080
S. Atlantic	31,450	12,631	10,796	+ 1,835
U. S.	108,415	72,324	73,995	— 1,631

Source: U. S. Department of Agriculture, *Agricultural Statistics: 1961.*

* 1960 United States per capita consumption of Fresh Apple (0.418 bu.) U.S.D.A. Agriculture Handbook No. 62, *Supplement for 1960 to Consumption of Food in the United States, 1909-52,* p. 7.

The Western Region is self-sufficient in fresh apples. The Central Region apparently relies heavily upon the Western Region, which supplies over half of the farmer's city market apple receipts. Apple markets in the Central Region are probably dominated by the influence of shippers in the Western Region.

Table 10 shows that over two-thirds of the apple receipts of the cities in the North Atlantic Region originate within the region, the remainder coming primarily from The West. Table 9 also shows there is a considerable quantity of apples produced in the South Atlantic Region which currently does not go into fresh use, but which could if cost and

[15] See Table 5, p. 12.

[16] These data were summarized from Table 7, p. 17.

price relationships became advantageous. Thus, relative to the North Atlantic Region, interregional competition is not so severe as intra-regional competition. New England, New York and New Jersey producers are all competing strongly on the large northeastern metropolitan markets with apples that can go into fresh or processing outlets.[17] Thus, when there is a short crop, apples that would normally go into processing outlets move into the fresh market when the price of fresh apples rises above a certain level. The price must, however, remain high enough (for certain varieties) to attract those fresh apples needed from the Western Region.

Table 10. Regional Receipts of Fresh Apples on Twenty-Four Major City Markets, 1959 and 1960*

Receiving Region	Shipments as % of Total Receipts in Region			
	From Western Region	From Central Region	From N. Atlantic Region	From S. Atlantic Region
Western	99.61	0.39	——	——
Central	51.58	29.90	8.06	10.46
N. Atlantic	22.40	0.42	71.09	6.09
S. Atlantic	24.04	1.89	28.96	45.11

Source: See Table 7, p. 17.

* The cities included are:
Western Region: Los Angeles, Seattle, Portland, San Francisco, and Denver.
Central Region: Ft. Worth, Dallas, New Orleans, Jackson, Miss., Birmingham, Minneapolis, Cleveland, St. Louis, Kansas City, Cincinnati, Detroit, and Chicago.
N. Atlantic Region: Philadelphia, Pittsburg, New York, and Boston.
S. Atlantic Region: Atlanta, Washington, D. C., and Baltimore.

The South Atlantic Region's markets apparently come closest to perfect competition with all regions supplying some apples. As shown in Table 9, only 40 percent of the apples produced in this region go through fresh marketing channels. Although this results in a total deficit of fresh apples in the region, the situation is quite stable. Many processing plants have been built in the Appalachian area and production practices are adapted to processing outlets. Within this institutional framework growers are not very willing to shift to fresh market outlets. Thus, on the large city markets listed for this region, the North Atlantic and Western Regions supply over one-half of the fresh apples while the remaining portion come from within the region.

Local vs. Distant Producers

In deficit areas, which depend on distant shippers for a sizeable portion of apples, local producers have a theoretical advantage. They do not incur the high transportation costs which are attached to that portion of the crop moving into the region. This would indicate abnormal profits for the local producer. If such were the case, the present situ-

[17] As will be discussed later, the quantity of apples going into fresh outlets tends to remain stable from year to year relative to the quantity going into processed use.

ation would not be stable over time. Local producers would expand production to the point at which increased costs and/or decreased returns would eliminate abnormal net revenue. Since this has not happened, it can be assumed that the local apple producer in deficit areas already faces production costs that are higher to the extent that they just about offset the costs of transportation accruing to distant producers.

The Time Factor

When analyzing regional competition on major markets for perishable products the time element must be considered. It is possible, in some instances, for two producing areas to share the market and yet not be on it concurrently. In the case of apples it is possible for all areas to ship at roughly the same time. This situation does not hold for such highly perishable items as strawberries or lettuce which are harvested at different dates in different areas and must be shipped immediately. Most apples are harvested at about the same time and then placed in storage from which they can be shipped at any time during the following six to eight months.

The general situation seems to be one in which local producers market early in the season and distant shippers later in the season. Assuming this to be the case, the Western Region, which sends a large portion of its crop to distant markets, would be expected to ship more heavily during a later part of the marketing season than the Central and Atlantic Regions, which dispose of their crops within the region. Although all regions have a peak of shipments in the late fall, the Western Region ships only about 40 percent of its total crop before January 1, while the Atlantic and Central regions ship over 70 percent of their crop before January 1.

There are two reasons for the current pattern of heavy shipments during the late fall. The first relates to the cost of storage facilities for fresh apples. Most of the apples moving to the fresh market during and immediately after harvest by-pass the storage operation. On a purely economic basis it is evident that growers will tend to sell large quantities of apples during this period. Even though it will depress price, "early selling" saves on storage costs. Since the initial costs of placing apples in storage is high, there is a strong incentive to market large quantities of fresh apples early in the season.

The second factor that disposes the industry towards early season marketing concerns the pattern of fresh citrus shipments to market. The pattern of monthly shipments of citrus fruits, which are apples' major competitors on the fruit market, do not reach a peak until December.[18] This provides some economic justification for apple shipments being relatively heavy between the time of harvest and the date when fresh citrus fruits are appearing on the market in large volumes. It must be remembered, however, that fresh citrus consumption (and therefore shipments) is declining rather rapidly in the face of accelerating consumption of frozen citrus concentrates which do not have a seasonal variation in supply.[19]

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[18] See Chart 8, p. 35.

[19] During the period 1955 to 1960 per capita consumption of fresh citrus fruits fell 20 percent while fresh apple consumption remained about stable.

In summary, all of these factors seem to point to the possibility of apple producers (especially those in deficit areas) increasing net returns through a leveling out of fresh shipments throughout the marketing season. Technological developments also appear to be strengthening this possibility. Advances in the technology of growing and harvesting are producing a product of higher quality that is more adaptable to storage. The Western Region has had an advantage storage-wise in that the varieties grown there (principally Delicious and Winesap) can be stored longer than the "softer" varieties (MacIntosh, Cortland, Rome, and York) which comprise the major portion of the crop produced in the Central and Atlantic Regions. "Controlled atmosphere storage" is reducing this advantage for it is now possible to store the once highly perishable MacIntosh through the entire marketing season.

A more even pattern of shipments from producers in all regions would presumably result in a lessening of intraregional but an increase in interregional competition. In general, the distant shippers predominate in the latter portion of the marketing season. Should nearby producers (located in deficit areas) store a larger portion of their crop and follow a seasonal shipping (or marketing) pattern similar to that of distant shippers, the competition between regions would increase.

Competition Between Fresh and Processed Apples

In addition to competing on the market with other fruit products, fresh apples also compete with processed apples and vice versa.

Processed Market a Buffer

The annual percentage of apples going into fresh or processed use varies considerably, due primarily to wide fluctuations in the size of the total crop. In general, a small crop will have a greater percentage going into fresh use than a large crop. Regression analysis indicates an inverse relationship between the size of the apple crop and the percentage of apples going into fresh use.[20] These implications are in agreement with general economic theory. When quantities are large, surpluses can be expected to go into lower price outlets. In the case of apples, these would be the processing outlets. During a small crop year, high prices of apples at the farm can be expected. Processors in this instance would be inclined to allow stocks of canned apples to dwindle, to buy just enough apples to fill the gap between stock on hand and expected consumption, and to maintain employment of machines and labor at the minimum level.

The annual quantity of apples going into fresh uses would, therefore, be expected to be more stable than the quantity going into processing outlets. A comparison of the variances of the annual quantities of apples

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[20] Using 1934-1960 annual data, a simple regression analysis produces the following equation:

$$Yc = 76.9023 - 0.0799X \quad (0.035)$$

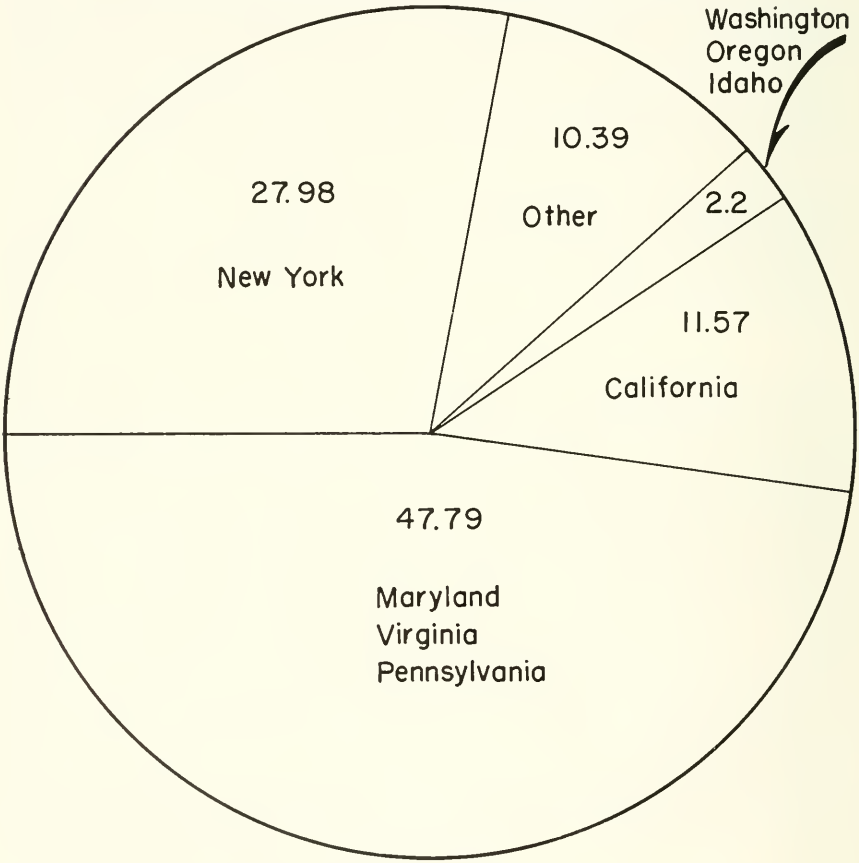
Yc = the estimated value of the percentage of the total crop used fresh.
X = total commercial apple production in millions of bushels.

going on the two markets during the period 1934 to 1960 showed this to be true.[21]

This result agrees with the logic of economic theory. The demand for a perishable product, such as fresh apples, can be expectd to be less sensitive to price changes in the short-run than the demand for a storable commodity such as canned apples. A large crop, therefore, cannot be moved through fresh-use channels at reasonable prices. Processors, however, generally have a more elastic demand relative to prices due to the fact that the end product is more storable. As a big crop depresses the price structure, processors move in and take over large quantities

CHART 4

Percentage of Total Pack of Canned Apples, Applesauce Produced in Various Areas, United States, 1960 and 1961



Total: 100% = 28,139,848 (24/2½ basis) cases.

Source: Division of Statistics, *National Canner's Association Reports*, Washington, D. C .

[21] The F — test indicated the difference in the variances was significant at the 95 percent level of probability.

of apples in order to supply the present demand for processed apples and to build up an inventory. During small crop years, the processor depends heavily on carry-over stocks.

If the price elasticities of demand on the two markets are different, it is possible, within the bounds of economic theory, for the apple industry to differentiate between the markets by using the processing outlet as a "buffer" for annual variations in crop size. At the present time, accurate data are not available for testing the significance of the difference between the elasticities on the two markets.

Concentration of Processing Markets

As apple production has concentrated in rather specific regions, processing has centered into an even fewer number of regions. Chart 4 shows that practically half of the apples processed are processed (and presumably grown) in Maryland, Pennsylvania, and Virginia. The second largest processing area is New York, followed by California. It is interesting here to note that while Washington and Oregon produced about one quarter of the country's total crop during the period, the quantity of apples going into processing from these states is relatively slight. Two factors are relevant here: (1) the apples produced in the Northwest are best suited to fresh use, and (2) processing facilities have never appeared in the area in large numbers because of the competition from fresh-market institutions. The Appalachian region of Maryland, Pennsylvania, and Virginia as well as New York apparently rely quite heavily upon the processors as an outlet for their apples. Since the apple processing industry is located in only a few production areas, this alternative-outlet is not available to growers in most areas.

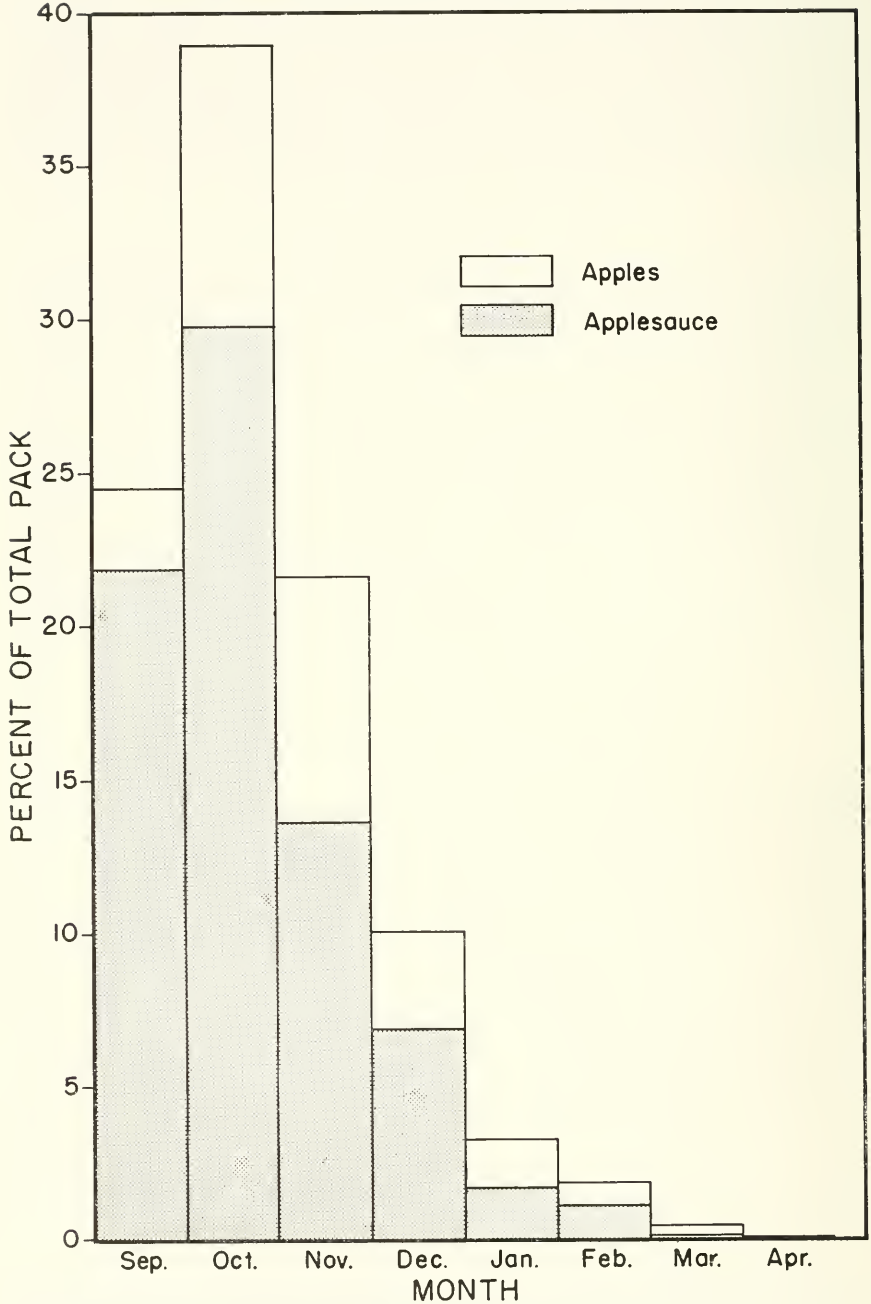
Most of Processing Sales are Early in the Marketing Season

In areas where apples are processed, the prospects of diverting a portion of the crop to processing-outlets diminish rapidly as the season advances. The average monthly pack of canned apples and apple sauce is shown in Chart 5. The pack is heavy during and immediately following harvest season, and then drops off sharply. By the end of December over 90 percent of the total processing crop has been packed. Once an apple has been placed in refrigerated storage, there is very little likelihood that it will be diverted to processing use. The cost of refrigerated storage is not warranted for apples destined for processing. Chart 6 shows that the average seasonal pattern of apple processing holds true for practically all areas processing apples. The only important exception to this pattern of heavy packs during September, October, and November is California, which produces and processes a different type of apple. California is primarily a producer of an early summer apple, primarily the Gravenstein variety, which accounted for one-third of the state's total production in 1953 and 1954. Since these apples are harvested during the summer and early fall months it is necessary that the pack of apples in California be heaviest during these months.

In a final analysis it would seem, therefore, that the quantity of apples produced varies considerably from year to year, dependent upon weather condition, disease, and insect damage. The quantity of apples

CHART 5

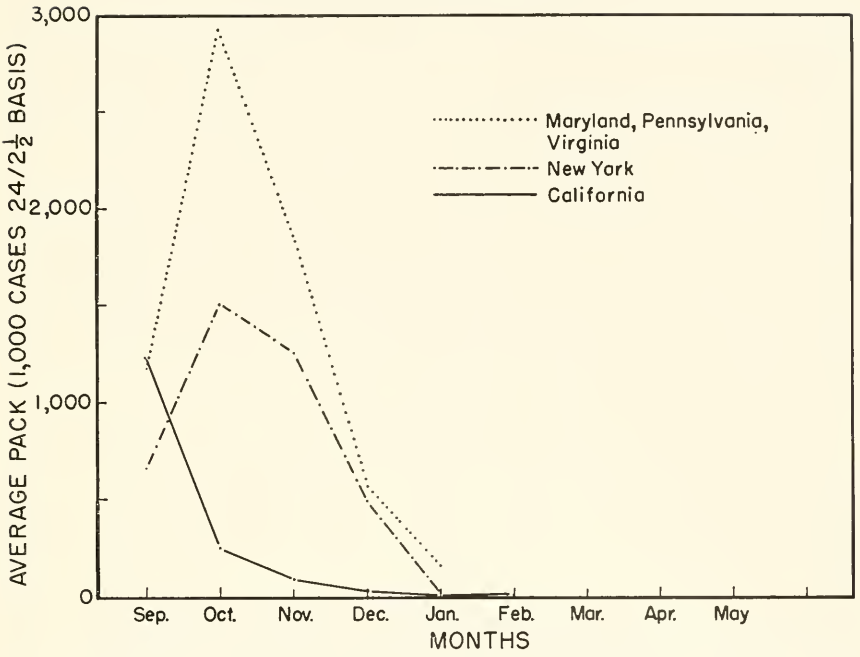
Seasonal Pattern of Canned Apples and Applesauce Pack, United States, 1960-1961



Source: Division of Statistics, *National Canner's Association Reports*, Washington, D. C.

CHART 6

Average Pack of Apples and Applesauce by Regions
United States, 1960-1961



Source: Division of Statistics, *National Canner's Association Reports*, Washington 6, D. C.

going on the fresh market is held fairly constant relative to the quantity of apples going on the processed market. Although there is competition between processing buyers and fresh market buyers, this is important only in a few states where growers have an alternative of selling apples to processors or to fresh market outlets. Many important producing areas, such as New England and the Pacific Northwest, market practically all of their crop on the fresh market and there is little or no competition at the farm level between processing buyers and fresh market buyers. Because processing plants have been concentrated in certain areas and because of the cost incident to transporting apples long distances to processing plants, it seems likely that the present situation will prevail — namely, many important apple producing areas have essentially only one market outlet for apples, the fresh market outlet.

Competition Between Apples and Other Products

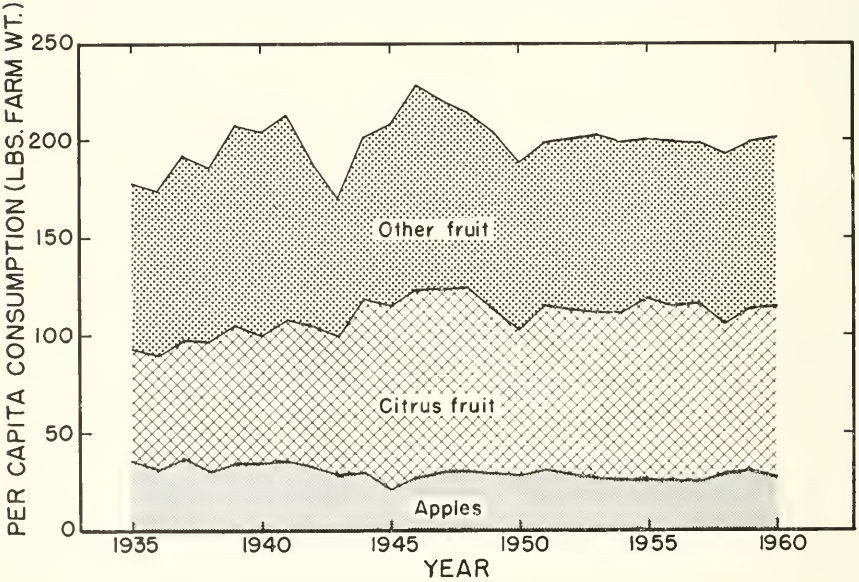
Competition from other fruits is also of importance in determining the structure of the apple market. It is the purpose of the following analysis to determine the nature of this type of competition.

It was noted earlier that per capita apple consumption has dropped quite drastically since the early 1900's. Probably one of the prime reasons for the decline has been the rapid expansion of citrus fruit consumption. Although many other fruits are currently available as substitutes, Chart 7 indicates that citrus fruit has been the major replacement, since per capita consumption of "other fruits" (those excluding citrus and apples) has not increased. It appears, therefore, that consumers have been substituting citrus fruits for apples.

Increased citrus consumption has probably been due more to changes in technology than to changes in tastes. Improvements in methods of production, handling, transportation, and processing have made citrus products available to consumers at prices that are more competitive with apple prices than they were twenty-five years ago. In addition, it is now possible for fresh citrus products to compete with apples in all parts of the United States rather than only southern and far western areas.

CHART 7

Per Capita Consumption of Fruit in the United States, 1935-1960



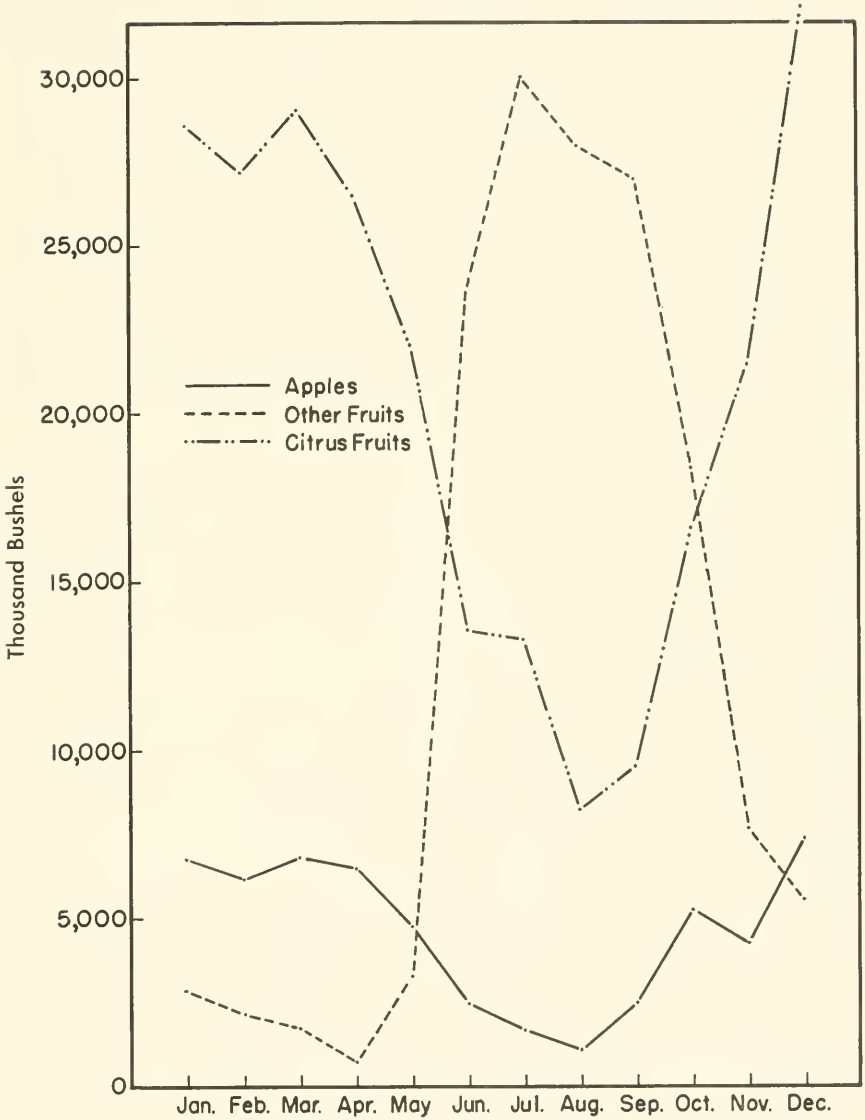
Source: *Consumption of Food in the U. S., 1909-1952*, Agricultural Handbook No. 62, U.S.D.A. BAE, Washington, D. C., September, 1953.

Also: 1956, 1960 Supplement to above publication published September, 1956, 1960.

One of the most important reasons for increased citrus consumption is frozen concentrated juice. In 1946 the per capita consumption (farm weight equivalent) of frozen citrus products was 0.3 pounds. By 1960 per capita consumption was 34.7 pounds which is 25 percent more than the consumption rate for all forms of apples. During the past 10 years

CHART 8

Average Volume of Shipments of Certain Fresh Fruits by Truck and Rail, United States, 1959 and 1960*



Source: U. S. Department of Agriculture, Agricultural Marketing Service, *Fresh Fruit and Vegetable Shipments by Commodities, States and Months,* 1959 and 1961.

* Includes rail and truck shipments, but truck data are incomplete as most short hauls by truck are not reported.

Other fruits include peaches, pears, cherries, grapes, plums, and fresh prunes.

Citrus fruits shipments, include oranges, satsumas, grapefruits, and mixed citrus shipments, but do not include lemons and tangerines.

the per capita consumption of fresh citrus fell about 25 percent as the frozen product replaced the fresh. This indicates that there has been a substitution of the new product for both fresh citrus and apples.

There is additional evidence that indicates citrus fruits are apples' major competitor on the fresh market. Apples and citrus are among the few fresh fruits with a marketing season starting late in the fall and extending through the winter months. Most other fresh fruits reach a peak in market volume during the late summer and early fall as shown in Chart 8. This is due to physical factors relating to the harvest dates of most deciduous fruits and their storing qualities in the fresh form. Most deciduous fruits are harvested during July and August and because of their perishable nature must be consumed (in the fresh form) within a short time.[22] These fruits, therefore, are not serious competitors of apples as far as a time schedule of marketings is concerned. The only fresh fruit imported in large quantities is the banana which is on the market at the same time as apples. Banana consumption, however, has remained stable at 18 pounds per person since the early 1930's, with sharp deviations only during 1942 and 1943 due to crop failures. Therefore, the position of bananas as a competitor does not seem to have changed during the time period under study.

Time series data indicates that citrus fruit consumption rates have been steadily increasing while per capita consumption of apples has been decreasing and other fruits have experienced little change in consumption rates. Fresh citrus fruits are the only item having the same marketing season as fresh apples. For these reasons it is probably that citrus fruits are the major competitor for apples on the market. It should be noted, however, that both processed citrus and apple products are experiencing an increase in consumption rates while the per capita consumption of the fresh products are falling off.

Although other items have some bearing, it would seem that the most relevant factors in determining the competitive nature of a given apple market are relative prices and quantities of fresh and processed apples and citrus fruit, and the volume and calendar of shipments from local and distant producers.

[22] Those noted in Chart 8.